

**United States of America****PROPOSALS FOR THE WORK OF THE CONFERENCE****AGENDA ITEM 1.13****Proposed modifications to Resolution 130 (WRC-97)****Background information**

In Resolution 130, WRC-97 established the sharing regime for non-GSO FSS and GSO FSS systems in certain frequencies between 10 and 30 GHz, specified provisional power limits for non-GSO FSS systems, and commenced a detailed study programme within ITU-R. After nearly three additional years of study in ITU-R, final power limits are expected to be adopted at WRC-2000. With the adoption of final power limits, many of the transitional provisions of Resolution 130 from WRC-97 can be suppressed, while certain non-transitional provisions are identified for reflection in the body of the Radio Regulations. The Annex containing provisional limits can also be suppressed.

There are elements of Resolution 130 that need to be retained. Indeed, CPM-99 recognized that there is a need to retain a suitably-modified Resolution 130, and provided in Annex 5 to Chapter 3 an example modification to Resolution 130 that forms the basis for these proposals. For example, studies on sharing among non-GSO FSS systems and studies on the appropriate frequency-sharing mechanism to employ in other bands where non-GSO FSS systems have been proposed.

The following proposals identify those elements of Resolution 130 (WRC-97) that are appropriate for suppression, retention, or updating, and present additional elements that have arisen during the 1997-2000 ITU-R study cycle requiring further study. While this proposal includes a request for further study on the aggregate $\text{epfd}_{\text{down}}$ limits and associated percentages of time for protection of the 3 m and 10 m GSO FSS earth stations, as referenced in the CITELE proposal on Resolution WWW (WRC-2000), the United States does not propose that the single entry validation, operational or additional operational limits be reconsidered.

MOD USA/12/202

RESOLUTION 130 (Rev.WRC-972000)**Use of non-geostationary systems in the fixed-satellite service in certain frequency bands**The World Radiocommunication Conference (~~Geneva, 1997~~Istanbul, 2000),**Reasons:** Editorial.*considering*

- a) that the International Telecommunication Union has, among its purposes, “to promote the extension of the benefit of the new telecommunication technologies to all the world’s inhabitants” (No. 6 of the Constitution of the International Telecommunication Union (Geneva, 1992));
- b) that it is desirable, in this respect, to promote systems capable of providing universal service;
- c) that new telecommunication services need advanced and reliable networks permitting high-capacity communications;
- d) the need to encourage the development and implementation of new technologies;
- e) that systems based on the use of new technologies associated with both geostationary (GSO) and non-geostationary (non-GSO) satellite constellations are capable of providing the most isolated regions of the world with high-capacity and low-cost means of communication;
- f) that there should be equitable access to the radio-frequency spectrum and orbital resources in a mutually acceptable manner that allows for new entrants in the provision of services;
- g) that all Member States[†] would benefit from the implementation of proposed systems in the allocated spectrum and from avoidance of monopolization or exclusive use of an allocation by a single system;
- h) that the operation of such systems requires a suitable amount of spectrum in appropriate frequency bands;
- i) that decisions on this matter should permit the operation of as many systems as possible;

MOD USA/12/203

- j) ~~that, in spite of the urgency attached to the development of such systems,~~ technical, operational and regulatory issues should be studied in order to achieve the most efficient use of the spectrum that may be available for these systems;
- k) that there is a need for the provision of services on a competitive basis between GSO fixed-satellite service (FSS) and non-GSO FSS systems as well as between non-GSO FSS and non-GSO FSS systems;

l) that the Radio Regulations must be sufficiently flexible to accommodate the introduction and implementation of innovative technologies as they evolve, and allow the further development and implementation of any proposed system in conformity with their provisions,

considering further

MOD USA/12/204

a) that ~~further~~ ITU-R has conducted technical, operational and regulatory studies ~~are required~~ in order to determine ~~further~~ the conditions under which sharing of the frequency bands 10-30 GHz which are allocated to the FSS and where ~~Resolution 46 (Rev.WRC-97) No. S9.11A~~ does not apply is feasible between GSO and non-GSO systems, ~~between non-GSO systems and between non-GSO and terrestrial systems and other space systems;~~

Reasons: All but the deletion proposed in line 4 of *considering further a)* are from the CPM Report; deletion of “between non-GSO systems” is necessary because past-tense reference to non-GSO/non-GSO studies is incorrect.

SUP USA/12/205

~~b) that it is likely that non-GSO FSS systems communicated to the Radiocommunication Bureau will not be brought into use before the WRC-99;~~

Reasons: Transitional measure that is no longer required.

MOD USA/12/206

~~e~~b) that the diverging interpretations arising from No. **S22.2** result in an ambiguous regulatory status for both existing and future GSO and non-GSO systems in the FSS in the bands where this provision applies, with consequential risks for both types of systems;

~~d~~c) that the harmonious development of non-GSO and GSO systems in the FSS requires that these ambiguities be resolved ~~with no further delay~~ in bands subject to No. **S22.2** where non-GSO FSS systems have been proposed;

Reasons: Clarification.

MOD USA/12/207

~~e~~d) that in resolving these ambiguities in the bands referred to in *resolves* 1 below, the GSO arc must be protected to ensure continued use of existing FSS systems and the development of new GSO technologies and systems in both non-planned bands and bands where plans exist;

SUP USA/12/208

~~f) that these ambiguities may be resolved in certain frequency bands by adopting power flux density (pfd) limits which would apply to non-GSO FSS systems to protect GSO FSS systems, and by including in Article **S22** limits on the power radiated by non-GSO FSS systems in order adequately to protect GSO FSS systems in the frequency bands and sharing situations where Resolution 46 (Rev.WRC-97) does not apply;~~

Reasons: This aspect has already been addressed in the review of the power limits conducted in advance of WRC-2000, and has not been shown to apply in any other bands. *Considering further f)* below covers the situation.

MOD USA/12/209

~~g~~e) that in certain frequency bands which are currently used or planned to be used extensively by GSO FSS systems, ~~provisional~~ power flux-density limits applicable to non-GSO FSS systems have been developed;

MOD USA/12/210

~~h~~f) that non-GSO FSS systems have been proposed in some of these bands which could meet ~~these limits~~ the limits in Tables **S22-1A, S22-1B, S22-1C, S22-2, S22-3, S22-4A and S22-4B** and would not require specific protection from existing and future GSO FSS systems, provided that minimum constraints are applied to GSO FSS systems, such as off-axis earth station e.i.r.p. limits;

Reasons: Clarification of which limits can be met by the proposed non-GSO FSS systems.

MOD USA/12/211

~~ig~~) that in the bands where the limits referred to in *considering further f), g) and h* would ~~e) and f)~~ apply, there ~~would be~~ is no need for a coordination procedure between non-GSO FSS and GSO systems, with the exception of coordination between earth stations operating in opposite directions of transmission and coordination with earth stations using very large antennas;

MOD USA/12/212

~~jh~~) that there ~~would be~~ is a need for a coordination procedure between non-GSO systems in the FSS and between non-GSO FSS systems and non-GSO systems in other services and for specific sharing criteria associated with this procedure, taking into consideration various types of non-GSO systems, including those in highly elliptical orbits;

SUP USA/12/213

~~k)~~ ~~the need to protect other co-primary services having allocations in the frequency bands referred to in considering further a) above and the need to assess further the sharing conditions between non-GSO FSS systems and these services;~~

Reasons: This has already been taken care of for the studied 10-30 GHz band, and would not apply with regard to non-GSO/non-GSO FSS studies in those bands.

MOD USA/12/214

~~li~~) that further studies on sharing conditions in frequency bands other than the 10-30 GHz frequency bands, where non-GSO FSS systems have been proposed, where ~~Resolution 46 (Rev.WRC-97) No. S9.11A~~ does not apply, and where Article S22 does not include limits for non-GSO FSS systems, may also be necessary on the basis of the requirements that may emerge,

Reasons: Clarification. With the exception of those *considering/considering further* with reasons below them, all changes other than to numbering are as recommended in Annex 5 to Chapter 3 of the Report of CPM-99-2. In *considering further* with reasons below them, only noted changes are different from what was recommended by the CPM.

noting

1 that information relating to GSO and non-GSO systems in the FSS in the 10-30 GHz bands has been communicated to the Bureau;

2 that some of these systems are in operation and others will be operated in the near future and, consequently, difficulties may be experienced in modifying their characteristics;

3 the need to protect existing and future terrestrial and space services and systems;

4 that No. **S22.2** is an operational provision which is to be applied between administrations, and does not require any specific action or finding by the Bureau,

recognizing

that the geostationary-satellite orbit and its associated spectrum are a uniquely valuable resource and that equitable access to this resource needs to be protected for all countries in the world,

ADD USA/12/215

further recognizing

that methods of calculating aggregate additional operational limits for protection of 3 m and 10 m earth stations in the bands 10.7-12.75 GHz requires further study,

SUP USA/12/216

resolves

~~1 — that, as of 22 November 1997, in the frequency bands specified in Tables **S22-3** and **S22-4** of Article **S22**, and in Tables 1 and 2 in Annex 1 to this Resolution, non-GSO FSS systems shall apply the procedures of Section I of Article **S9**, Nos. **S9.17** and **S9.17A**/Sections I and III of Article **11** and the procedures of Article **S11/13**, and the non-GSO FSS systems for which complete notification information has been received by the Bureau after 21 November 1997 shall be subject to the provisional power limits in Article **S22** and in Annex 1 to this Resolution;~~

Reasons: This provision can be suppressed, as it is included within Example Radio Regulation No. **S22.5F** as agreed and included in Annex 1 to Chapter 3 to the Report of CPM-99-2 (see also proposal IAP/14/263).

SUP USA/12/217

~~2 — that these limits shall be applied provisionally until the end of WRC-99, and that non-GSO FSS systems for which complete notification information has been received by the Bureau after 21 November 1997 shall be subject to the power limits in Article **S22**, as revised, if appropriate, by WRC-99;~~

Reasons: This provision is a transitional measure that is no longer required after WRC-2000.

SUP USA/12/218

~~3 — that, as of 22 November 1997, in applying No. **S22.2**, administrations may consider these provisional power limits as corresponding to permissible levels of interference from a non-GSO system into a GSO system, irrespective of the dates of receipt by the Bureau of the complete notification information relating for the non-GSO system and of the complete coordination information for the GSO network;~~

Reasons: This provision is a transitional measure that is no longer required after WRC-2000.

SUP USA/12/219

~~4 — that, as of the end of WRC-99, an administration operating a non-GSO FSS system which is in compliance with the limits in Article **S22**, as revised, if appropriate, by WRC-99, shall be considered as having fulfilled its obligations under No. **S22.2** with respect to any GSO network, irrespective of the dates of receipt by the Bureau of the complete notification information for the non-GSO system and of the complete coordination information for the GSO network;~~

Reasons: This provision can be suppressed, as it is included within Example Radio Regulation No. **S22.5G** as agreed and included in Annex 1 to Chapter 3 to the report of CPM-99-2 (see also Proposal IAP/14/264).

SUP USA/12/220

~~5~~ that, as of the end of WRC-99, in the frequency bands specified in No. ~~S22.29~~ and § 2.4 of Annex 1 to this Resolution, GSO FSS systems for which complete coordination information has been received by the Bureau after the end of WRC-99 shall be subject to the limits in Article ~~S22~~ and in § 2.1, 2.2 and 2.3 of Annex 1 to this Resolution, as revised, if appropriate, by WRC-99;

Reasons: This provision must be suppressed, as the United States proposal (contained in USA/12/184 to 185) is to modify No. S22.26 and suppress Nos. S22.27 to S22.29, so that there are no off-axis e.i.r.p. density limits for FSS systems contained in S22 as of the end of WRC-2000 under this provision.

MOD USA/12/221

~~61~~ that, as of 22 November 1997, in the frequency bands specified in No. ~~S22.29~~ and ~~Tables 1 and 2 of Annex 1 to this Resolution~~ Tables ~~S22-1A~~, ~~S22-1B~~, ~~S22-1C~~ and ~~S22-2~~, non-GSO systems shall not claim protection from GSO networks in the FSS operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete notification information for the non-GSO FSS systems and of the complete coordination information for the GSO networks;

Reasons: *Resolves* 6 from Resolution 130 (renumbered here as *resolves* 1) is an essential provision that is not dependent on the establishment of minimum constraints on GSO FSS systems. The United States is also proposing to retain this measure permanently in the Radio Regulations (see Document WRC2000/12(Add.11)).

MOD USA/12/222

~~61.1~~ that, in the case that, between 22 November 1997 and the end of WRC-~~99~~2000, if an administration operating or bringing into use a GSO FSS system before the end of WRC-~~99~~2000, because it considered that a non-GSO FSS system proposed by another administration might cause unacceptable interference into its GSO system, ~~then~~:

MOD USA/12/223

~~6.1.1~~ ~~the administration operating the GSO system shall send~~ sent to the administration operating the non-GSO FSS system the technical details upon which its disagreement is based, and if this is not resolved by the end of WRC-2000, then:

MOD USA/12/224

~~6.1.2~~ 1.1.1 in the bands from 10.7 GHz to 14.5 GHz, unless the limits adopted by WRC-2000 are met, the administration operating the non-GSO FSS system shall resolve the difficulties,

MOD USA/12/225

~~6.1.3~~ 1.1.2 in the bands 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space) and 29.5-30.0 GHz (Earth-to-space), unless the limits adopted by WRC-2000 are met, the administrations concerned shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks;

Reasons: Although the provisions of *resolves* 6.1 must, by their terms, have been invoked prior to the end of WRC-2000, the actions contemplated by *resolves* 6.1.2 and 6.1.3 could extend beyond the end of WRC-2000. Thus, it is necessary to retain a suitably modified *resolves* 6.1, 6.1.1, 6.1.2, and 6.1.3. If this *resolves* has not been invoked by the end of WRC-2000, WRC-2000 may consider its suppression.

MOD USA/12/226

~~72~~ that, if an administration bringing into use a GSO FSS system after the end of WRC-99~~2000~~ considers that a non-GSO FSS system proposed by another administration and which complies with the limits in Article **S22**, as revised, if appropriate, by WRC-99, might cause unacceptable interference into its GSO system, the administrations concerned shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks;

Reasons: This *resolves* should be retained to encourage good faith efforts by administrations operating GSO FSS and non-GSO FSS systems with regard to protection of future GSO FSS operations.

SUP USA/12/227

~~8~~ that, as of 22 November 1997, non-GSO systems in the FSS in the frequency bands referred to in *resolves* 1 above, shall, for coordination with other non-GSO FSS systems, be subject to application of the provisions of § 2.1 of Section II of Resolution **46 (Rev.WRC-97)/No. S9.12**,

requests ITU-R

MOD USA/12/228

~~1¹ taking into account considering further a), to conduct and complete, as a matter of urgency, and complete, in time for consideration by WRC-99; the studies, in the frequency bands specified in Tables **S22-1A**, **S22-1B**, **S22-1C** and **S22-2**, relating to the sharing criteria to be applied during the coordination between non-GSO FSS systems where No. **S9.10** applies, with a view to promoting efficient use of spectrum/orbit resources and equitable access to these resources by all countries;~~

MOD USA/12/229

¹ See Annex 2~~1~~ for further details concerning specific aspects of these studies in relation to frequency sharing between systems in the non-GSO FSS and the GSO FSS.

SUP USA/12/230

~~1.1 the appropriate technical, operational and regulatory studies to review the regulatory conditions relating to the coexistence of non-GSO and GSO systems in the FSS, in order to ensure that they do not impose undue constraints on the development of non-GSO and GSO FSS systems;~~

SUP USA/12/231

~~1.2 the development of a methodology for calculating the power levels produced by non-GSO FSS systems and the compliance of these levels with the limits referred to in *resolves* 1 and 2 above;~~

1.3 the studies relating to the sharing criteria to be applied for determining the need for coordination between non-GSO FSS systems and the need for coordination between terrestrial services and non-GSO systems in the FSS and in other space services, with a view to promoting efficient use of spectrum/orbit resources and equitable access to these resources by all countries;

ADD USA/12/232

2 to conduct further study of the aggregate $epfd_{down}$ limits and associated percentages of time for the 3 m and 10 m GSO FSS earth station antennas from Resolution **WWW (WRC-2000)**, Table WWW-1A, to determine whether the aggregate interference caused by all co-frequency non-GSO FSS systems in the subject bands into GSO FSS systems exceeds the maximum interference levels that are necessary to protect these GSO systems (see Annex 2);

ADD USA/12/233

3 to develop methods of calculating aggregate additional operational limits for the protection of 3 m and 10 m earth stations in the bands 10.7-12.75 GHz;

MOD USA/12/234

~~24¹ taking into account considering further 1), to undertake the development to conduct the appropriate technical, operational and regulatory studies towards the possible development of power limits or other frequency sharing mechanisms among GSO, non-GSO and terrestrial systems in the frequency bands other than those referred to in resolves requests ITU-R 1 above, where No. S9.11A does not apply, and where non-GSO FSS systems are likely to be implemented have been proposed, and where GSO FSS systems are used or expected to be used extensively,~~

MOD USA/12/229

¹ See Annex 2~~1~~ for further details concerning specific aspects of these studies in relation to frequency sharing between systems in the non-GSO FSS and the GSO FSS.

Reasons: Modifications to *requests ITU-R 1* are a streamlined version of recommended change from the CPM Report. Certain material from the CPM recommendation has already been addressed in the 10-30 GHz band, and need not be further studied. Modifications to *requests ITU-R 2* and suppression of *requests ITU-R 1.1* and *1.2* are slightly modified from that recommended in Annex 5 to Chapter 3 of the Report of CPM-99-2 to focus the scope of the studies that may be conducted in response to *requests ITU-R 2*.

instructs the Radiocommunication Bureau

MOD USA/12/235

1 as of the end of WRC-99~~2000~~, to review and, if appropriate, revise, any finding previously made on the compliance with the limits contained in Article **S22** of a non-GSO FSS system for which complete notification or coordination information, as appropriate, has been received between 22 November 1997 and the end of WRC-99~~2000~~. This review shall be based on the values in Article **S22**, as revised, ~~if appropriate,~~ by WRC-99~~2000~~;

ADD USA/12/236

2 that, between 22 November 1997 and 2 June 2000, non-GSO systems in the FSS in the frequency bands referred to in *resolves 1* above, shall, for coordination with other non-GSO FSS systems, be subject to application of the provisions of No. **S9.12**;

Reasons: This is consequential to proposing non-GSO/non-GSO FSS coordination pursuant to a new Radio Regulation No. S9.10 as of 2 June 2000 (IAP proposal IAP/14/273 (ADD S9.10)).

ADD USA/12/237

3 to report to WRC-03 the results of studies under *requests ITU-R 1, 2, 3 and 4*.

SUP USA/12/238

~~ANNEX 1 TO RESOLUTION 130 (WRC 97)~~

Provisional limits

Reasons: Suppression of Annex 1 is as recommended in Annex 5 to Chapter 3 of the Report of CPM-99-2.

MOD USA/12/239

ANNEX 21 TO RESOLUTION 130 (Rev.WRC-972000)

ITU-R studies on frequency sharing between non-GSO FSS and GSO FSS

The following is a list of the studies and related activities required.

SUP USA/12/240

~~1 Characterization of short duration interference peaks which might exceed equivalent pfd limits set by a world radiocommunication conference for large earth station antennas, in terms of maximum and mean amplitudes, maximum and mean durations, mean time between occurrences, aggregate percentages of time of occurrences and typical amplitude/time profiles.~~

MOD USA/12/241

21 Acquisition of data relating to the impact of the interference peaks on the performance of a range of earth station demodulators of various types and origins. ~~Administrations are encouraged to cooperate in this matter by arranging for the appropriate measurements to be carried out, and submitting the results to the appropriate working parties or task groups in time to be included in the ITU-R report to the next conference.~~

MOD USA/12/242

32 ~~Carrying out computer simulations to determine the impact on equivalent pfd statistics of multiple non-GSO networks interfering with a GSO downlink, and in particular to discover the percentage of time thresholds for which the probability of simultaneous interference peaks from satellites in different non-GSO constellations becomes significant. Both homogeneous and inhomogeneous sets of non-GSO systems should be simulated where the necessary data are available. Identify the parameters and appropriate assumptions necessary to calculate pfd statistics from multiple non-GSO FSS systems into a GSO earth station. Calculate and compare aggregate pfd statistics using various modelling options including full simulation, a modified pfd mask (ITU-R Document 11/153), and convolution. Determine the number and location of GSO earth station test points required to accurately characterize the aggregate interference.~~

SUP USA/12/243

~~4 Conducting investigations to find out whether the emissions from the satellites and earth stations of non-GSO systems would cause problems for the tracking, telemetry and command of GSO (and non-GSO) satellites, during both their launch and operational phases, and the development of methods for avoiding such problems.~~

MOD USA/12/244

53 Carrying out computer simulations to derive the time statistics of short-term interference between two or more non-GSO FSS networks, with the objective of determining ~~the approximate number of such networks which could co-exist in the same bands~~how such networks could co-exist.

SUP USA/12/245

~~6 Identification and validation of software which could be used by the Bureau to check whether a system for which an application for spectrum has been made would comply with the equivalent pfd and aggregate pfd limits.~~

MOD USA/12/246

74 Carrying out studies to determine the feasibility of frequency sharing between non-GSO FSS networks using circular orbits and ~~networks using slightly inclined geostationary orbits, and also between non-GSO FSS networks and networks using “quasi-geostationary”~~non-circular orbits.

SUP USA/12/247

~~8 Development, if practicable, of continuous curves of equivalent pfd versus antenna diameter and/or G/T of the GSO earth station to be protected. Whilst it may be necessary to limit the compliance checking by the Bureau to a few discrete antenna sizes, administrations will need to know that the protection will be adequate in the case of antennas of other sizes; hence the desirability of continuous curves.~~

MOD USA/12/248

95 Continuation of studies on techniques for the mitigation of interference ~~between GSO and non-GSO networks, and between~~amongst non-GSO networks.

SUP USA/12/249

~~10 Refinement of the methodologies in Recommendation ITU-R S.1323 for the derivation of I/N limits and their conversion to equivalent pfd and aggregate pfd limits, taking into account propagation fade statistics, the different circumstances of “transparent” and remodulating satellite transponders, and the impact of fade counter measures such as adaptive power control.~~

SUP USA/12/250

~~11 Consideration of how account can be taken, in studies concerning the definition of uplink limits, of the gain versus off-axis angle characteristics of the receiving spot beams of geostationary satellites.~~

SUP USA/12/251

~~12 Taking into account that the bands allocated to the FSS are used by the fixed, radiolocation and space science services, study of the criteria for sharing between non-GSO FSS and GSO FSS systems and systems in those services.~~

Reasons: Certain of the studies ordered in Annex 2 to Resolution 130 (WRC-97) remain valid in the modified version of Resolution 130 that will be adopted by WRC-2000. Retention of a modified annex will help facilitate the work of ITU-R.

ADD USA/12/252

ANNEX 2 TO RESOLUTION 130 (Rev.WRC-2000)

Further study is required of the aggregate $\text{epfd}_{\text{down}}$ limits and associated percentages of time for the 3 m and 10 m GSO FSS earth station antennas from Resolution WWW (WRC-2000), Table WWW-1A, to determine whether the aggregate interference caused by all co-frequency non-GSO FSS systems in the subject bands into GSO FSS systems exceeds the maximum interference levels that are necessary to protect these GSO systems.

Reasons: Consequential to the addition of *requests ITU-R 2*. See also *further recognizing* from IAP/14/287 (Resolution **WWW (WRC-2000)**).
